



**WASTE CYCLE**



Total municipal waste generation between 2006 and 2007 marked a substantial stability with a growth of about 0.1%.

Despite the stability recorded in the last two years, the generation of municipal waste between 1997 and 2007 increased from 26.6 million tons to about 32.5 million tons.

In 2007 per capita generation of municipal waste at national level was of about 546 kg/inhabitant per year.

## Generation and separate collection of municipal waste

In 2007 the national generation of municipal waste reached 32.5 million tons, a value similar to the one recorded in 2006 (Figure 10.1). The growth in these two years is actually just above 30,000 tons, marking an increase of about 0.1%.

Despite the relative stability of the last two years, in the period between 2003-2007 the total generation of municipal waste increased by about 8.4% with more substantial increases between 2003 and 2004 (+3.7%) and between 2005 and 2006 (+2.7%). A more controlled growth was recorded between 2004 and 2005 and in the last year (+1.6%).

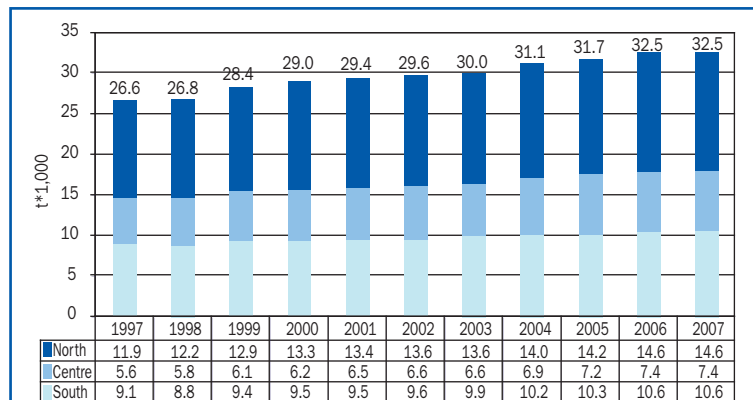


Figure 10.1: Generation of municipal waste<sup>1</sup>

With reference to single geographical macroareas, it can be observed that in general data on the North of Italy reflect the national trend with a growth, even in this case, of 0.1% between 2006 and 2007. A slightly higher increase, but still very slight, can be seen in the South, with a growth of about 0.2% while a substantial stability is recorded in the Centre of Italy (about -0.02%).

The analysis of per capita data is necessary to extract the individual production level from that of the resident population. In this regard, in 2007 a decrease was observed with respect to the

<sup>1</sup> Source: ISPRA



previous year: the national per capita production recorded about 546 kg/inhabitant per year, compared to the 550 kg/ inhabitant per year of 2006.

In particular, it should be noted that the per capita production is substantially influenced by the increase in the official resident population, which grew by 488,003 units (+0,8%) between the 31<sup>st</sup> December 2006 and the 31<sup>st</sup> December 2007, and therefore it is larger with respect to the recorded municipal waste data.

In the three geographical macroareas the highest production values in 2007 are similar to the ones reported above and therefore are found in the Centre, with about 630 kg/inhabitant per year. The lowest values are recorded in the South with about 508 kg/ inhabitant per year. In particular, the Centre recorded a 1.1% drop in the per capita municipal waste production percentage with respect to the previous year (which is about -7 kg/ inhabitant per year) and a contraction of about 0.2% in the South (-1 kg/ inhabitant per year).

The North produces about 539 kg/ inhabitant per year, which is -0.9% with respect to 2006 (-5 kg/ inhabitant per year).

Despite the substantial stability of the total production of municipal waste it can be observed that between 2006 and 2007, separate collection at national level increased by almost 590,000 tons (+5.8%). This growth brings the amount of separately collected waste to about 9 million tons, representing 27.5% of the total municipal waste generation (Figure 10.2).

However, the collection is still below the 35% target by Article 205 of Legislative Decree no. 152/2006 to be reached by 31<sup>st</sup> December 2006 the 40% target introduced by Law no. 296 of 27 December 2006, to be reached by 31<sup>st</sup> December 2007.

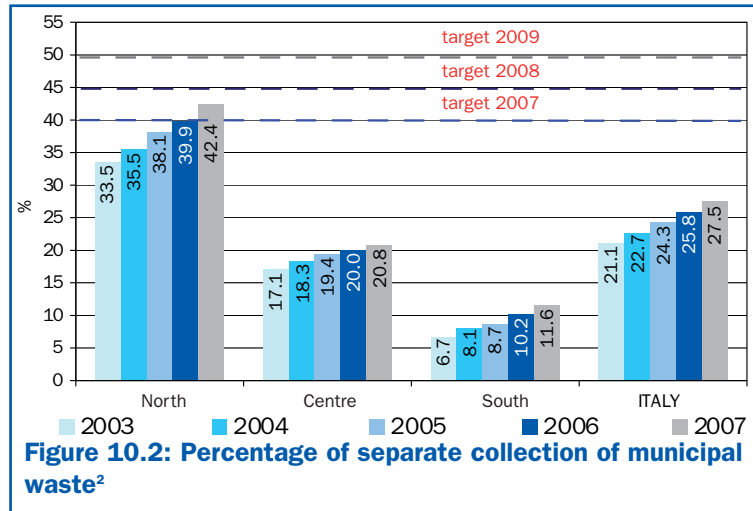
In any case, the analysis of geographical macroareas highlights an extremely diversified scenario: while the North (with a collection rate of 42.4%) is clearly beyond the 2007 target, which was actually almost reached in 2006 (39.9%), the Centre and South (with respectively 20.8% and 11.6%) are still very far from achieving the target.

*The highest per capita production values in 2007 are found in the Centre of Italy (630 kg/ inhabitant per year) and the lowest are found in the South (508 kg/ inhabitant per year). The North produces 539 kg/ inhabitant per year.*

*In 2007, the percentage of separate collection at national level was of 27.5%.*



There is a diversified scenario in the three macroareas: the North (with a separate collection rate of 42.4%) is clearly beyond the target of 40% set by the Law of 2007) while the Centre and South (with respectively of 20.8% and 11.6%) are still very far from achieving the target.



In the North (where the separate collection system is already well developed) between 2006 and 2007 the total growth of waste from separate collection amounted at 380,000 tons (+6.5%). A minor increase can be observed in the South (almost 150,000 tons more, between 2006 and 2007). However, this increase corresponds to a particularly relevant rise in percentage terms (about +13.8%), considering the low collection levels that had been recorded so far in this specific macroarea. In Central regions of Italy the increase in separate collection reached about 58,000 tons (+3.9%). This is a lower value with respect to the growth recorded the previous year, which reached about 84,000 tons (+6.1%).

In 2007, the regions with the highest percentages of separate collection are Trentino Alto Adige and Veneto with over 50% (53.4% and 51.4%, respectively). More than a half of municipal waste generated in these two regions is therefore collected separately. Regions that almost reach the 45% (the target established by the law, to be reached by December 31<sup>st</sup>

In 2007, the regions with the highest percentages of separate collection are Trentino Alto Adige (53.4%) and Veneto (51.4%). Piedmont and Lombardy almost reach 45%.

<sup>2</sup> Source: ISPRA



2008) are Piedmont (44.8%) and Lombardy (44.5%). In general, all the regions in North of Italy, are well above a separate collection performance of 35%, with the exception of Liguria (19%),

In the Centre, during 2007, the only region with a separate collection rate over the 30% threshold was Toscana (about 31.3%), followed by Umbria (25%) and Marche (21%). Lazio, instead, reached a rate of 12.1%. Among the Southern regions of Italy, Sardinia reached a separate collection rate of 27.8%. The region increased its separate collection of almost 18% (in 2005 the rate of separate collection was below the 10%). Abruzzo follows with a rate of 19% (18.6%) in 2007 and Campania with 13.5%. Other regions of the South (Molise, Basilicata, Apulia, Calabria and Sicily) still have separate collection rates below the 10%.

At provincial level it can be noticed that in 2007, 29 provinces out of 107 (5 more than in 2006) went over a 40% rate of separate collection (15 of these collect more than 50%), while 39 provinces collect a quantity lower than 20% (6 less than in 2006). The provinces with the highest collection rates are Treviso and Novara, with percentages respectively of 69.1% and 61.1%, confirming the data recorded in 2006.

A relevant growth was recorded in the last year in the province of Medio Campidano (Sardinia). The percentage of separate collection increased from 43.8% in 2006 to 59.1% in 2007.

Rates higher than 55% are recorded in different provinces of the North and particularly in Trento (56.1%), Padova (55.6%), Varese (55.5%), Verbania (55.5%) and Cremona (55%), while separate collection rates between 50 and 55% are found in Rovigo (53.9%), Bergamo (52.8%), Gorizia (52.2%), Lecco (52.1%), Asti (50.7%) and Bolzano (50.2%).

It is worth noting that, apart from the province of Medio Campidano, even the province of Ogliastra (also located in Sardinia) has a separate collection value higher than 40% (42.3%).

Several provinces in Toscana, and one province in Sardinia (Oristano) are among the provinces with a separate collection rate above the 30%. The lower percentages are found in the provinces of Caltanissetta, Siracusa and Messina (all below 4%) as well as

*Among the Southern regions of Italy, Sardinia has a separate collection rate of 27.8%. In 2005 the percentage of separate waste collection was lower than 10%.*

*Various provinces in the North have separate waste collection percentages above the 50%.*



in Frosinone, Rieti, Isernia and Campobasso, with rates between 4 and 5%.

### **Separate waste collection at municipal level**

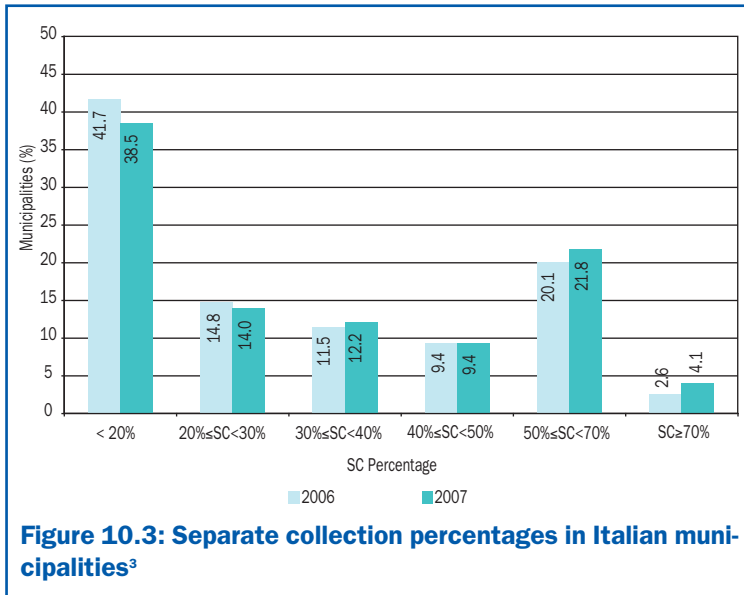
Data on the generation and separate collection of municipal waste are collected and processed by ISPRA for each single city, except for cases in which only joint information is available for mountain communities, basin consortiums or unions of municipalities. These, however, include a very limited number of municipalities which, in 2007, reached 191 (2.4% of the total number of Italian municipalities and 1.2% of the national population).

Of the above 191 municipalities, 83 are located in the North of Italy, mainly in the region of Aosta Valley (73), 33 in the Centre (27 in the province of Rieti and 6 in the province of Frosinone) and 75 in the South (of which 30 in the province of Palermo and 35 in the province of Agrigento).

A first analysis based on data collected in 2007 is shown in Figure 10.3. The 7,910 municipalities for which separate collection data are available are divided into different classes.

More than one half of the analyzed municipalities (about 52.5% which is equivalent to 4,156 municipalities) in 2007 has separate collection percentages lower than 30%, while only about 4.1% of the cases (although with an increasing trend with respect to 2006) showed collection rates higher than 70%. The percentage of municipalities that in 2007 had a collection rate between 50% and 70% is of 21.8% (also in this case with an increasing trend with respect to 2006) while the percentage of those having collection rates between 40% and 50% and between 30% and 40% is respectively of 9.4% and 12.2%.

In order to have a more in-depth analysis of the separate waste collection performances, the different municipalities can be divided into various classes of resident population. In this way, the impact that municipalities with the highest collection percentages have in their specific classes can be analysed.



An analysis of data at municipal level conducted in 2007 shows that 4.1% of municipalities have separate collection rates higher than 70%, while over half (about 52.5%) have collection rates below 30%.

In particular, municipalities can be divided into the following population classes:

- 1 – 5,000 inhabitants
- 5,001 – 15,000 inhabitants
- 15,001 – 30,000 inhabitants
- 30,001 – 50,000 inhabitants
- 50,001 – 150,000 inhabitants
- >150,000 inhabitants

The division of municipalities into the above classes is shown in Table 10.1. It should be noted that the analysis below only takes into account the municipalities that were able to provide single data on their specific separate collection in 2007 (this was possible for 7,910 municipalities, which represent about 97.6% of total Italian municipalities and 98.8% of the national population).

<sup>3</sup> Source: ISPRA



By dividing municipalities into classes, according to the resident population, it can be noted that 70% of the same have less than 5,000 inhabitants while 27 cities have more than 150,000 inhabitants.

**Table 10.1: Division of municipalities into classes of resident population<sup>4</sup>**

Population classes	Municipalities	Population	Municipality percentage	Population percentage
	number		%	
0 – 5,000	5,557	10,120,254	70.3	17.2
5,001 – 15,000	1,650	14,067,572	20.9	23.9
15,001 – 30,000	401	8,236,216	5.1	14.0
30,001 – 50,000	157	5,935,743	2.0	10.1
50,001 – 150,000	118	8,758,193	1.5	14.9
>150,000	27	11,791,131	0.3	20.0
<b>TOTAL</b>	<b>7,910</b>	<b>58,909,109</b>	<b>100.0</b>	<b>100.0</b>

With reference to the analysed samples, it can be noted that over 70% of municipalities have less than 5,000 residents while only 17.2% of the population lives there. If we include even the municipalities having between 5,001 and 15,000 inhabitants, the percentage (out of total municipalities) reaches about 91.2%. In terms of population, about 41% of the 58.9 million inhabitants (which is the total population of analysed municipalities) live in cities having a resident population lower than 15,000 inhabitants. The cities with more than 150,000 inhabitants are 27, representing 0.3% of analysed municipalities but 20% of the national population. Once having divided the population into classes, we can proceed by grouping up the municipalities belonging to each class according to their separate collection of waste (SC) levels. To this purpose, the following ranges have been identified:

- SC < 20%
- 20% ≤ SC < 30%
- 30% ≤ SC < 40%
- 40% ≤ SC < 50%
- 50% ≤ SC < 60%
- 60% ≤ SC < 70%
- SC ≥ 70%

The results of the analyses that were conducted are reported in Table 10.2. The fifth column of the table shows the percentage of municipalities (belonging to a given population class) that fall within the

<sup>4</sup> Fonte: ISPRA





range of separate collection indicated in column 2, with respect to the total number of municipalities of the same class. The sixth column, instead, refers to the relationship between the resident population in the municipalities falling within a given range of separate collection and the total population in the municipalities of that class.

**Table 10.2: Summary of separate waste collection percentages in Italian municipalities, according to classes of resident population<sup>5</sup> (2007)**

Resident population class	SC level	Municipalities	Population	Number of municipalities/ Total number of municipalities in the same class	Municipality population/ Total population in the same class
		number		%	
0-5,000	SC<20%	2, 181	3,803,030	39.2	37.6
	20%≤SC<30%	851	1,297,307	15.3	12.8
	30%≤SC<40%	636	1,154,490	11.4	11.4
	40%≤SC<50%	494	967,538	8.9	9.6
	50%≤SC<60%	630	1,252,719	11.3	12.4
	60%≤SC<70%	549	1,187,249	9.9	11.7
	SC≥70%	216	457,921	3.9	4.5
<b>total</b>		<b>5,557</b>	<b>10,120,254</b>	<b>100.0</b>	<b>100.0</b>
5,001 – 15,000	SC<20%	554	4,747,212	33.6	33.7
	20%≤SC<30%	185	1,549,194	11.2	11.0
	30%≤SC<40%	218	1,896,463	13.2	13.5
	40%≤SC<50%	173	1,481,709	10.5	10.5
	50%≤SC<60%	202	1,756,350	12.2	12.5
	60%≤SC<70%	225	1,849,869	13.6	13.1
	SC≥70%	93	786,775	5.6	5.6
<b>total</b>		<b>1,650</b>	<b>14,067,572</b>	<b>100.0</b>	<b>100.0</b>
15,001 – 30,000	SC<20%	159	3,339,987	39.7	40.6
	20%≤SC<30%	37	710,126	9.2	8.6
	30%≤SC<40%	60	1,257,823	15.0	15.3
	40%≤SC<50%	46	937,694	11.5	11.4
	50%≤SC<60%	50	1,022,779	12.5	12.4
	60%≤SC<70%	39	782,125	9.7	9.5
	SC≥70%	10	185,682	2.5	2.3
<b>total</b>		<b>401</b>	<b>8,236,216</b>	<b>100.0</b>	<b>100.0</b>

continues

*By dividing municipalities belonging to different population classes into ranges of separate collection of waste, it can be noted that municipalities with a higher separate collection rate are less as the population grows in dimension.*

<sup>5</sup> Source: ISPRA



follows

**Table 10.2: Summary of separate waste collection percentages in Italian municipalities, according to classes of resident population<sup>5</sup> (2007)**

Resident population class	SC level	Municipalities	Population	Number of municipalities/ Total number of municipalities in the same class	Municipality population/ Total population in the same class
		number		%	
30,001 – 50,000	SC<20%	83	3,162,491	52.9	51.9
	20%≤SC<30%	15	535,119	9.6	8.8
	30%≤SC<40%	18	681,082	11.5	11.2
	40%≤SC<50%	15	591,691	9.6	9.7
	50%≤SC<60%	16	777,556	10.2	12.8
	60%≤SC<70%	8	284,728	5.1	4.7
	SC≥70%	2	61,297	1.3	1.0
	<b>total</b>	<b>157</b>	<b>6,093,964</b>	<b>100.0</b>	<b>100.0</b>
50,001 – 150,000	SC<20%	60	4,154,265	50.8	47.4
	20%≤SC<30%	16	1,220,463	13.6	13.9
	30%≤SC<40%	19	1,521,716	16.1	17.4
	40%≤SC<50%	15	1,275,403	12.7	14.6
	50%≤SC<60%	6	426,542	5.1	4.9
	60%≤SC<70%	2	159,804	1.7	1.8
	SC≥70%	0	0	0.0	0.0
	<b>total</b>	<b>118</b>	<b>8,758,193</b>	<b>100.0</b>	<b>100.0</b>
>150,000	SC<20%	12	6,728,998	44.4	56.2
	20%≤SC<30%	3	804,536	11.1	6.7
	30%≤SC<40%	11	4,095,307	40.7	34.2
	40%≤SC<50%	1	341,263	3.7	2.9
	50%≤SC<60%	0	0	0.0	0.0
	60%≤SC<70%	0	0	0.0	0.0
	SC≥70%	0	0	0.0	0.0
	<b>total</b>	<b>27</b>	<b>11,970,104</b>	<b>100.0</b>	<b>100.0</b>
<b>TOTAL</b>		<b>7,910</b>	<b>59,246,303</b>		

As forecasted, as the population grows in dimensions there is a lower number of municipalities with higher rates of separate collection. In larger centres, for example, there are no cases of separate collection higher than 50%.

As regards municipalities with less than 5,000 inhabitants, about 34% of analysed samples have percentages of separate collec-



tion higher than 40%. In terms of population, these municipalities represent 38.2% of the total.

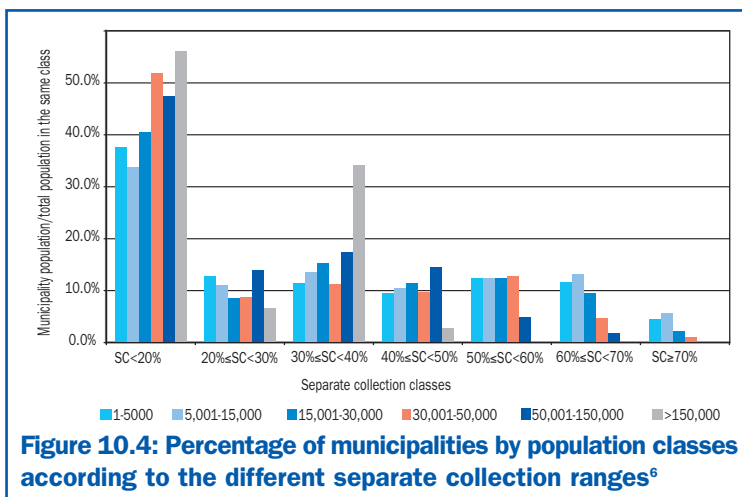
As for the class above (i.e. municipalities with a resident population between 5,001 and 15,000 inhabitants), 42% of municipalities have the best performance of separate collection (>40%) both in terms of number and in terms of population. In the class between 15,001-30,000, the number of municipalities with the highest percentages of SC is again below 40% (about 36%), while for municipalities with a number of inhabitants between 30,001 and 50,000 the percentage of those having a SC rate higher than 40% is 26% (in terms of number of municipalities) and 28% (in terms of resident population).

As regards the class between 50,001-150,000 inhabitants, the percentage of municipalities with the highest percentages of separate collection is of 19% (in number) and about 21% (in terms of resident population).

Evidence that the number of municipalities with highest SC rates reduce as the dimension of the municipalities grow can be seen from the analysis reported in Figure 10.4. This shows the percentage of municipalities (population/total population in the same class) belonging to the various classes of population according to the different ranges of separate collection.

*In the class of municipalities with less than 5,000 inhabitants about 34% of municipalities have a SC rate higher than 40%. In centres with a population between 5,001 and 15,000 inhabitants, the number of municipalities with the highest SC rate (>40%) is of about 42%.*

*The larger municipalities never have separate collection rates higher than 50% and only one of them has a collection rate higher than 40%. However, 11 cities have collection rates between 30% and 40% of the total municipal waste production.*



**Figure 10.4: Percentage of municipalities by population classes according to the different separate collection ranges<sup>6</sup>**

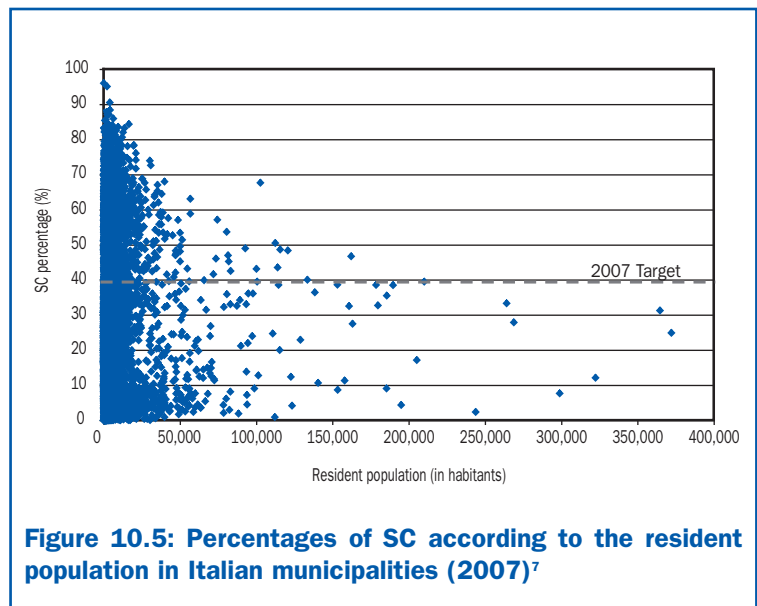
<sup>6</sup> Source: ISPRA



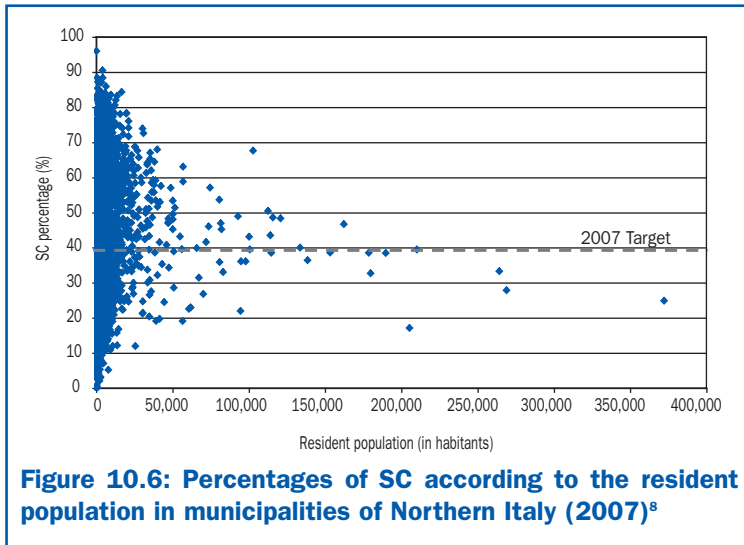
To this purpose, it should be highlighted that even if larger municipalities never have separate collection rates higher than 50% and only one of them has a collection rate higher above 40%, 11 cities still have separate collection rates between 30% and 40% of the total municipal waste production (34.2% of the total population in the large municipalities).

The following figures show the percentages of separate collection in the single municipalities according to the resident population of the same. The figures refer to all Italian municipalities (Figure 10.5) and to municipalities in the respective geographical macroareas (Figures 10.6-10.7-10.8). For a better interpretation of the figures below, it should be noted that urban centres with a resident population higher than 500,000 (Turin, Milan, Genoa, Rome, Naples and Palermo) have been excluded from the analysis.

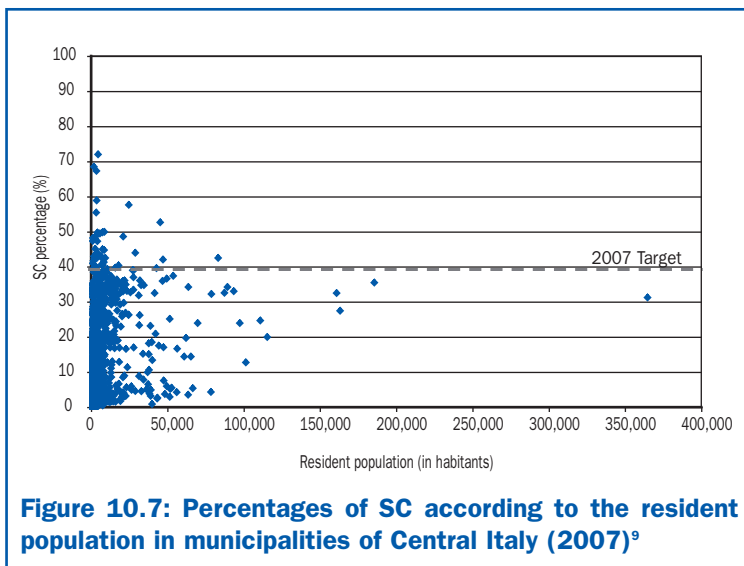
*By analysing the percentages of separate waste collection of single municipalities according to the resident population it can be observed that in Italy most municipalities have collection rates lower than 40%.*



<sup>7</sup> Source: ISPRA



*In the North, there is an almost symmetrical distribution of municipalities reaching the 40% target of separate collection, both for smaller and medium-large municipalities in terms of resident population.*



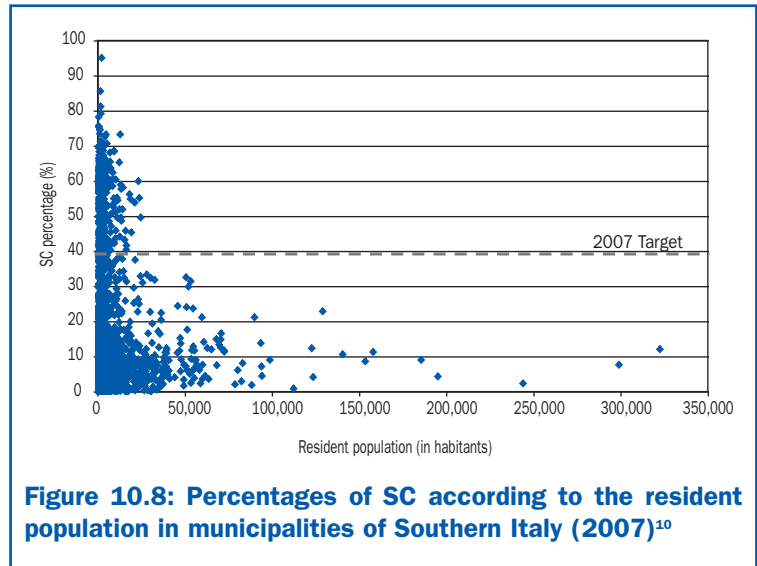
*In the Centre, there is a more asymmetrical distribution with a higher concentration of lower separate collection percentages.*

<sup>8</sup> Source: ISPRA

<sup>9</sup> Source: ISPRA



*In the South, there is an asymmetrical distribution with a more pronounced concentration of low separate collection percentages.*



An analysis of the above figures shows that there is a higher presence of municipalities with high SC rates in Northern Italy and a higher concentration of low collection rates in Central and Southern Italy. The North has an almost symmetrical distribution with respect to the 40% target both for smaller municipalities and for medium and large ones in terms of resident population. The Centre and South, instead, have a more asymmetrical distribution with a higher concentration of municipalities having a low separate collection rate. In the Centre, this trend is more evident even in the smaller municipalities, while in the South there is a higher number of smaller municipalities with SC rates higher than the 40% target but most municipalities fall in any case below the SC threshold of 20%. Municipalities with a separate collection rate higher than 40% are almost all located in Abruzzo (6.9%), Campania (23.9%) and Sardinia (67.5%).

<sup>10</sup> Source: ISPRA



In the South, unlike the Centre, there is even a decreasing trend in the separate collection rate as the dimensions of the municipality increases. Indeed, in 2007 urban centres with a resident population from 25,000 upwards did not report separate collection rates higher than 35%.

